



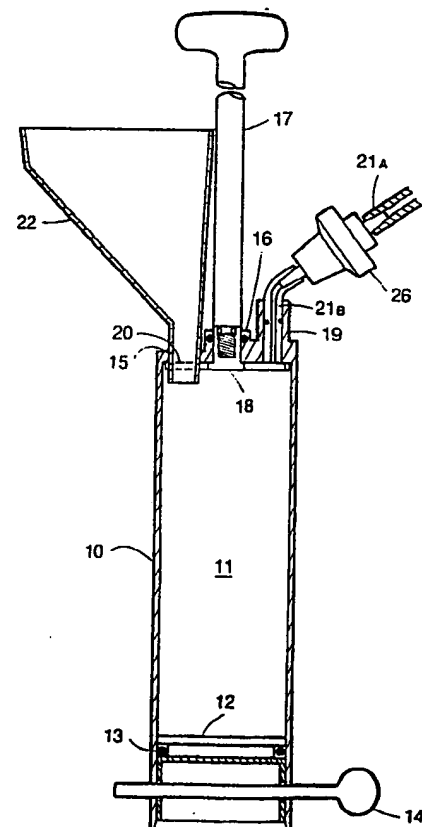
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<p>(51) International Patent Classification ⁵ : B01F 3/12, 13/06, A61F 2/46</p>	<p>A1</p>	<p>(11) International Publication Number: WO 93/22041</p> <p>(43) International Publication Date: 11 November 1993 (11.11.93)</p>		
<table style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <p>(21) International Application Number: PCT/SE93/00366</p> <p>(22) International Filing Date: 27 April 1993 (27.04.93)</p> <p>(30) Priority data: 9201353-1 29 April 1992 (29.04.92) SE</p> <p>(71) Applicant: CEMVAC SYSTEM AB [SE/SE]; Box 207, S-311 23 Falkenberg (SE).</p> <p>(72) Inventors: JONSSON, Sören ; Rönnhagsvägen 38, S-582 70 Linköping (SE). SMEDS, Staffan ; Glyttinge Östergård, S-585 99 Linköping (SE). THORLING, Jan ; Pl 4242, S-791 91 Falun (SE). NILSSON, Thomas ; Breviksvägen 3, S-311 45 Falkenberg (SE). BERGMAN, Torvald ; Hasselgatan 154, S-194 37 Upplands Väsby (SE).</p> </td> <td style="width: 50%; vertical-align: top;"> <p>(74) Agent: WILLQUIST, Bo; Pats. Willquist Patenter AB, S:t Larsgatan 23, S-583 24 Linköping (SE).</p> <p>(81) Designated States: AU, CA, DK, FI, JP, KR, NO, RU, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).</p> <p>Published <i>With international search report.</i> <i>In English translation (filed in Swedish).</i></p> </td> </tr> </table>			<p>(21) International Application Number: PCT/SE93/00366</p> <p>(22) International Filing Date: 27 April 1993 (27.04.93)</p> <p>(30) Priority data: 9201353-1 29 April 1992 (29.04.92) SE</p> <p>(71) Applicant: CEMVAC SYSTEM AB [SE/SE]; Box 207, S-311 23 Falkenberg (SE).</p> <p>(72) Inventors: JONSSON, Sören ; Rönnhagsvägen 38, S-582 70 Linköping (SE). SMEDS, Staffan ; Glyttinge Östergård, S-585 99 Linköping (SE). THORLING, Jan ; Pl 4242, S-791 91 Falun (SE). NILSSON, Thomas ; Breviksvägen 3, S-311 45 Falkenberg (SE). BERGMAN, Torvald ; Hasselgatan 154, S-194 37 Upplands Väsby (SE).</p>	<p>(74) Agent: WILLQUIST, Bo; Pats. Willquist Patenter AB, S:t Larsgatan 23, S-583 24 Linköping (SE).</p> <p>(81) Designated States: AU, CA, DK, FI, JP, KR, NO, RU, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).</p> <p>Published <i>With international search report.</i> <i>In English translation (filed in Swedish).</i></p>
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(54) Title: DEVICE FOR PREPARING BONE CEMENT

(57) Abstract

The invention relates to an arrangement for the preparation of bone cement, including a cylindrical chamber (11), which has means for the introduction of the constituents, which is closed off at one end with a piston (12) that is slidable in a position of application, and which at the other end is closed off by means of a lid (15). This lid has a central aperture (16) for a detachable agitator rod (17), which is demountably attached to an agitator device (18), axially movable within the chamber. The lid (15) includes a connection (19) for a vacuum-suction device (21), as well as a closable inlet (20) for the constituent components, which are to be mixed in the chamber. The vacuum-suction device is intended to produce a flow of air from the surroundings, through a funnel (22) attached to the inlet (20), into the chamber and forward towards the connection (19).



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DEVICE FOR PREPARING BONE CEMENT.

The present invention relates to an arrangement for preparation of bone cement consisting of at least two constituent components, including a cylindrical chamber, which has means for introduction of the constituents, which are to be mixed in the chamber, and for closing the chamber after introduction of said constituents, whereby one end of the chamber is closed by a slidable piston for ejection of the mixture, and the other end is closed by a lid, which includes a connection for a vacuum-suction device, as well as a central aperture for a detachable agitator rod, which is attached to an agitator device, axially movable within the chamber.

When preparing bone cement, which for instance is used for attachment of hip-joint prostheses, toxic or in other ways environmentally hazardous gases occur, which causes problems. Bone cement is normally prepared through mixing of powdered polymethylmethacrylate and liquid methylmethacrylate monomer. It is important that the mixture should be as homogeneous as possible, since lack of homogeneity and gas inclusions have the effect of reducing the strength of the bone cement. Gases which occur during the preparation are odourous and noxious.

SE, B, 450545 discloses a method and a device for the preparation of bone cement. The substances to be mixed are placed in an open vessel, which thereafter is closed, and vacuum is applied for withdrawing surplus gases from the mixing vessel. However, this known device does not solve the problem of gas discharge during the open time of the vessel.

WO, A, 9013264 discloses other arrangements for mixing, which also employs vacuum for surplus gas withdrawal. One of the embodiments discloses a device in which the introduction of the bone cement constituents is achieved

through the hollow agitator rod. Thus, introduction takes place through a relatively long and narrow channel, which renders the introduction more difficult.

5 The object of the present invention is to make available an arrangement according to the introductory parts of the description, which facilitates introduction, with minimal risk of gas discharge.

10 For this purpose, the invention is characterized in that said means include a single inlet with an introduction funnel which, at least during an introductory course, is hermetically connected, and that the vacuum-suction device
15 is intended to produce a flow of air from the surroundings through the funnel and the inlet, into the chamber and forward towards the connection.

Preferred embodiments of the invention are apparent from the accompanying dependent claims.

20

One embodiment of the invention will now be further described with reference to the accompanying drawings in which, Figure 1 is a side view of an embodiment of a mixer according to the invention, prepared for introduction of
25 the constituent components, Figure 2 illustrates a plug for closing the inlet of the chamber, Figure 3 illustrates an ejection tube and Figure 4 illustrates the mixing agitator device viewed from below. Figure 5 is a longitudinal section of an alternative embodiment of the mixer according
30 to the invention, with an inlet in the shape of a channel, placed on the outside of the cylindrical chamber and emerging into the chamber from the cylindrical wall.

In the drawings, the number 10 denotes a mixing cylinder
35 with an inner chamber 11, which has one end closed by a piston 12, equipped with a gasket ring 13 and in a position of application, is slidable into the chamber 11. In Figure 1 the piston 12 is locked by means of a cotter pin 14,

which extends through the cylinder 10 as well as the piston 12.

5 The other end of the chamber 11 is closed by means of a lid 15, preferably integrated with the cylinder 10, and presents a central aperture with a gasket ring against an agitator rod 17. This rod is demountably attached to an agitator rod, movable within the chamber 11.

10 Furthermore the lid 15 is provided with a fixed connection nipple 19. In addition there is an inlet 20 for the constituent components to be mixed in the chamber 11.

15 There is a demountable, tightly connected choke 21B in the connection nipple 19, which is joined to a filter 26. The choke 21B is axially movable in and out of the chamber 11.

20 The mixing device is in Figure 1 displayed in a position for introduction of the constituent components; which means that the nipple 19, the choke 21B and the filter 26 are joined, by means of a tube 21A, to a non-displayed vacuum-suction device, which by the filter 26 is prevented from being contaminated by the substances added to the chamber. The inlet 20 has been provided with an hermetically
25 connected funnel. The vacuum-suction device is arranged to generate a negative pressure in the chamber 11, which propagates to the funnel 22.

30 The negative pressure generates a flow of air from the surroundings through the funnel 22, and sucks down the constituent components to be mixed in the chamber 11, and at the same time vapors that are produced from these components. Noxious gases are in this way prevented from spreading to the surroundings. The non-displayed vacuum-suction device preferably contains active carbon, to
35 effectively purify said gases, and may also be supplemented with a so called sterile filter.

Subsequently to the introduction of substances, the funnel 22 is removed and an airtight plug 23, disclosed in Figure 2, is inserted into the inlet 20. The mixing may now be accomplished, and in the meantime, suction is continued of
5 the formed gases with an increased negative pressure via the choke 21B, the filter 26 and the tube 21A, whereby a continuous suction flow is established. The mixing procedure itself is accomplished by moving the agitator device 18 up and down in the chamber by means of the
10 agitator rod during simultaneous twisting.

After approximately twenty pumping movements according to above, the agitator rod 17 is pulled towards the lid 15, the agitator device 18 is twisted until one of the notches
15 24 or one of the cavities 27, is in front of the choke 21B, which now may be pushed down or screwed down to lock the agitator device 18 against turning. The agitator rod 17 may now be unscrewed from the agitator device 18, which closes the aperture 16.

20 The tube 21A, the filter 26 and the choke 21B can be demounted from the nipple 19, after which the ejection nozzle, illustrated in Figure 3, is screwed onto the nipple 19. After removal of the cotter pin 14, the mixer is
25 placed in a known syringe mechanism for ejection of the mixed content in chamber 11, by means of the ejection nozzle 25.

For the embodiment of a mixing device according to the
30 invention illustrated in Figure 5, all that was indicated for the embodiment according to Figure 1 is valid, except that the inlet 20 for the constituents intended for mixing in the chamber 11, is placed on the cylindrical wall of the chamber.

35 The inlet 20 communicates with the funnel 22 via a channel 28 placed on the outside of the chamber wall. An advantage of this embodiment is that a certain premixture of the

constituent components of bone cement is achieved, due to the fact that the first substance, by its level in the chamber, covers the inlet 20. When the second substance is introduced, it will be forced to pass through the first substance.

5

While the invention has been described with reference to the illustrated embodiments, it will be understood that variations are possible within the inventive concept of the following claims. For instance, it is not necessary for the lid 15 to be manufactured as an integrated part of the mixing cylinder, it may for production reasons be manufactured as a detachable part which can be screwed onto the mixer cylinder.

10

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Patent Claims

1. Arrangement for the preparation of bone cement consisting of at least two constituent components, including a cylindrical chamber (11), which has means for the introduction of the constituents, which are to be mixed in the chamber, and for closing the chamber (11) after the introduction of said constituents, whereby one end of the chamber is closed by means of a slidable piston (12) for ejection of the mixture, and the other end is closed by a lid (15), which includes a connection (19) for a vacuum-suction device (21), as well as a central aperture (16) for a detachable agitator rod (17), which is attached to a agitator device (18), axially movable within the chamber, characterized in that said means include a single inlet (20) with an introduction funnel (22) which, at least during an introduction process, is hermetically connected, and that the vacuum-suction device is intended to produce a flow of air from the surroundings through the funnel (22) and the inlet (20), into the chamber (11) and forward towards the connection (19).
2. Arrangement according to claim 1, characterized in that the vacuum-suction device includes a purification filter containing active carbon and a sterile filter.
3. Arrangement according to any of the preceeding claims, characterized in that the connection (19) following demounting of the choke (21B), forms a firmament for an ejection nozzle.
4. Arrangement according to any of the preceeding claims, characterized in that the inlet (20) emerges into the lid (15).

5. Arrangement according to any of the claims 1-3, characterized in that the inlet (20) emerges into the cylindrical wall of the chamber (11).

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6. Arrangement according to any of the preceding claims, characterized in that the choke (21B) is slidable into the mixing chamber (11).

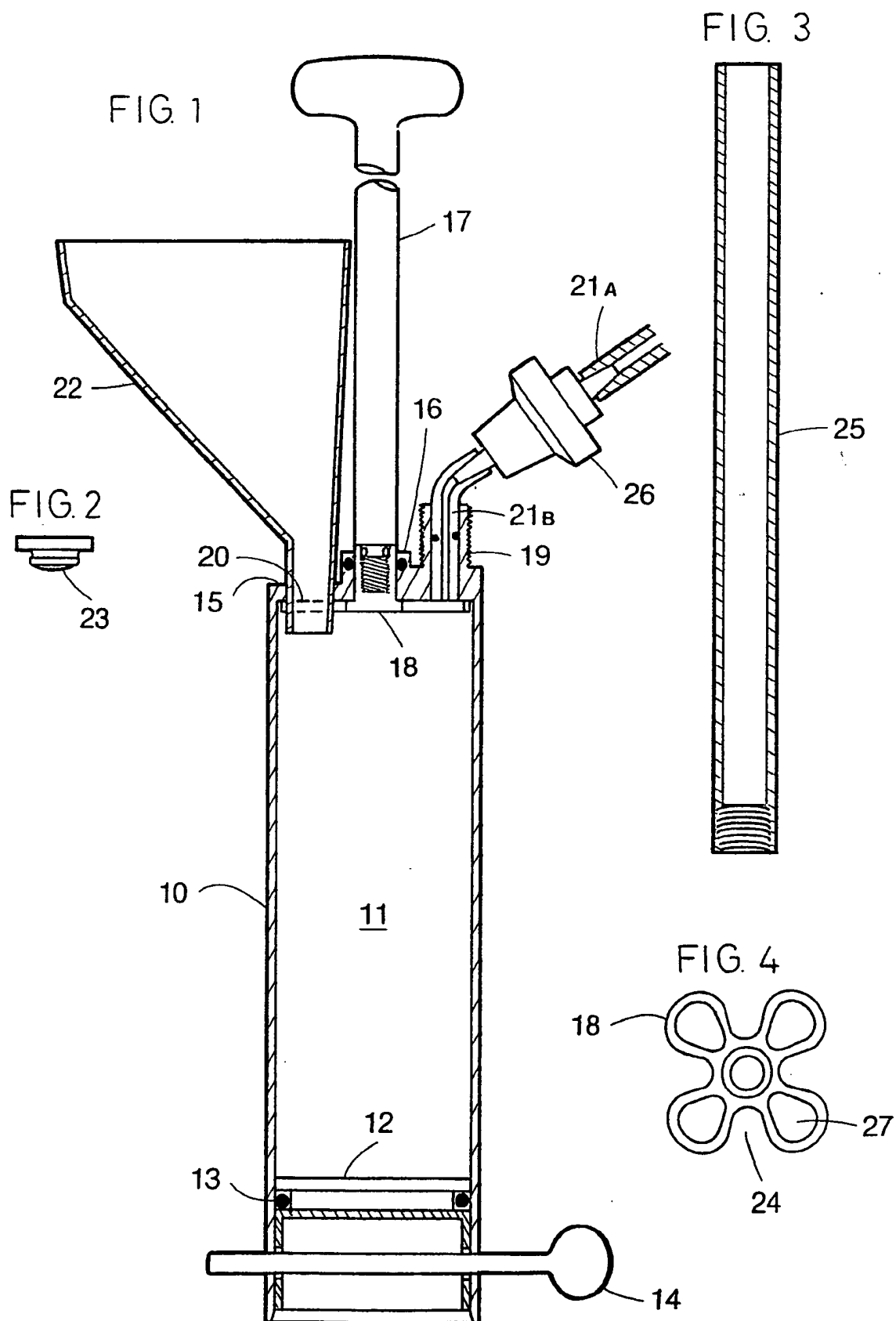
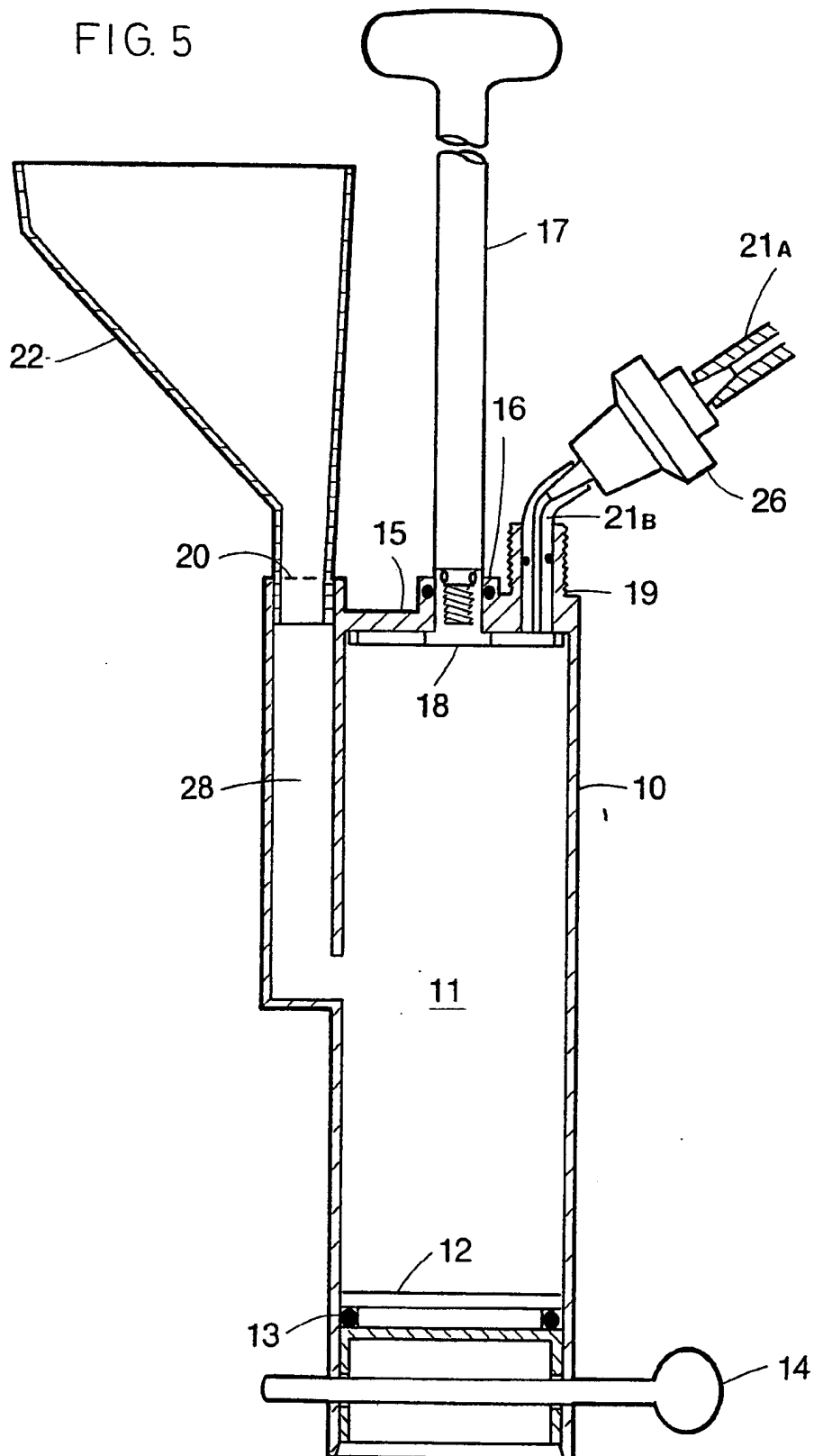


FIG. 5



INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 93/00366

A. CLASSIFICATION OF SUBJECT MATTER

IPC5: B01F 3/12, B01F 13/06, A61F 2/46

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC5: B01F, A61F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	SE, B, 462315 (SURGITEC AB), 11 June 1990 (11.06.90), page 2, line 11 - line 27, figure 2 --	1-6
A	Patent Abstracts of Japan, Vol 10, No 292, C-376, abstract of JP, A, 61-111130 (OKI ELECTRIC IND CO LTD), 29 May 1986 (29.05.86) -- -----	1-6

☐ Further documents are listed in the continuation of Box C.

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Date of the actual completion of the international search

5 August 1993

Date of mailing of the international search report

10 -08- 1993

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